

INFORMATIONAL LEAFLET NO. 173

PRELIMINARY FORECASTS AND PROJECTIONS FOR 1978

ALASKAN SALMON FISHERIES

Prepared by:

**Division of Commercial Fisheries
ALASKA DEPARTMENT OF FISH AND GAME**

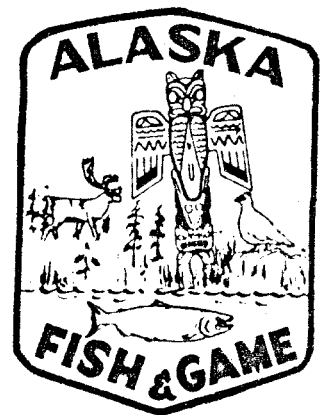
STATE OF ALASKA

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February 1978

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ABSTRACT

A commercial salmon harvest of 63 million fish is projected for Alaska in 1978. The harvest is not expected to be less than 40 million nor more than 100 million. Based on projection experience since 1970, only 1 of 5 realized harvests would fall outside this range. It should be noted that Alaskan salmon harvests have not exceeded 100 million since 1941, and harvests have been below 70 million since 1949.

In 1977 commercial fishermen harvested more than 49 million salmon in Alaska. The increase of 14 million fish projected for 1978 is primarily due to anticipated stronger pink salmon returns to all statistical regions.

INTRODUCTION

This is the ninth in a series of annual reports prepared by the Division of Commercial Fisheries, Alaska Department of Fish and Game, presenting harvest and return forecasts and projections of Alaska's commercial salmon fisheries. These reports are released in December to make the information available to the Board of Fisheries and the fishing industry well before the season begins.

In order to provide forecast information at this time it has been necessary to utilize preliminary harvest and return data from the 1977 season. In the past, forecasts and projections based on final harvest and return data have differed little from the preliminary results.

Projections of statewide commercial salmon harvests have been made yearly since 1969. A summary of the accuracy of these projections is presented in Table 1. On the average, the projections have been too high by about 600,000 fish, or 2% of the average realized commercial harvest. The average error without regard to sign is 28% of the actual harvest or 11 million fish. Projection errors stem from imprecise knowledge of salmon escapements, numbers of fry or smolt produced and estuarine and marine survival.

Terminology and Definitions

Salmon return or run:	The total number of mature salmon returning in a given year from ocean rearing areas to coastal waters.
Escapement, spawning population or brood stock:	That portion of a salmon run which is not harvested and survives to reach the spawning grounds.
Forecast:	Forecast harvests and returns are calculated using ancillary information such as parent-year escapements, subsequent fry abundance, spring sea water temperatures and escapement requirements.
Harvest Projection:	Harvest projections are averages of recent harvests. They may be modified subjectively when qualitative escapement or other relevant information is available. Only harvests are projected.

TABLE 1. PROJECTED AND REALIZED ALASKA COMMERCIAL SALMON HARVEST,
WITH ABSOLUTE AND RELATIVE ERRORS, 1970-1977.

(Number of fish in millions)

Season	(1) Projected harvest	(2) Actual harvest	(3) Error: (1) - (2)	(4) Relative Error: (3)/(2) X 100%
1970	91.5	68.5	23.0	34%
1971	41.5	47.5	-6.0	-13%
1972	46.7	32.0	14.7	46%
1973	30.0	22.3	7.7	35%
1974	15.6	21.8	-6.2	-28%
1975	19.9	26.2	-6.3	-24%
1976	37.1	44.4	-7.3	-16%
1977	34.7	49.6 ^{a/}	-14.9	-30%
TOTAL	317.0	312.3	4.7 (86.1) ^{b/}	
<hr/>				
1970-77 Average	39.6	39.0	0.6 (10.8) ^{b/} - 2%	(28%) ^{b/}

^{a/} Preliminary data.

^{b/} Values in parentheses are the sum or average of errors or relative errors without regard to sign.

Pacific Salmon Species

<u>Scientific Name</u>	<u>Common Names</u>
<u>Oncorhynchus tshawytscha</u>	chinook, king
<u>Oncorhynchus nerka</u>	sockeye, red
<u>Oncorhynchus kisutch</u>	coho, silver
<u>Oncorhynchus gorbuscha</u>	pink, humpy, humpback
<u>Oncorhynchus keta</u>	chum, dog

Primary Brood Years Contributing to the 1978 Salmon Return^{a/}

Species	Age of Returning Salmon in Years				
	2	3	4	5	6
Pink	1976				
Chum		1975	1974		
Coho		1975	1974		
Sockeye			1974	1973	1972
Chinook			1974	1973	1972

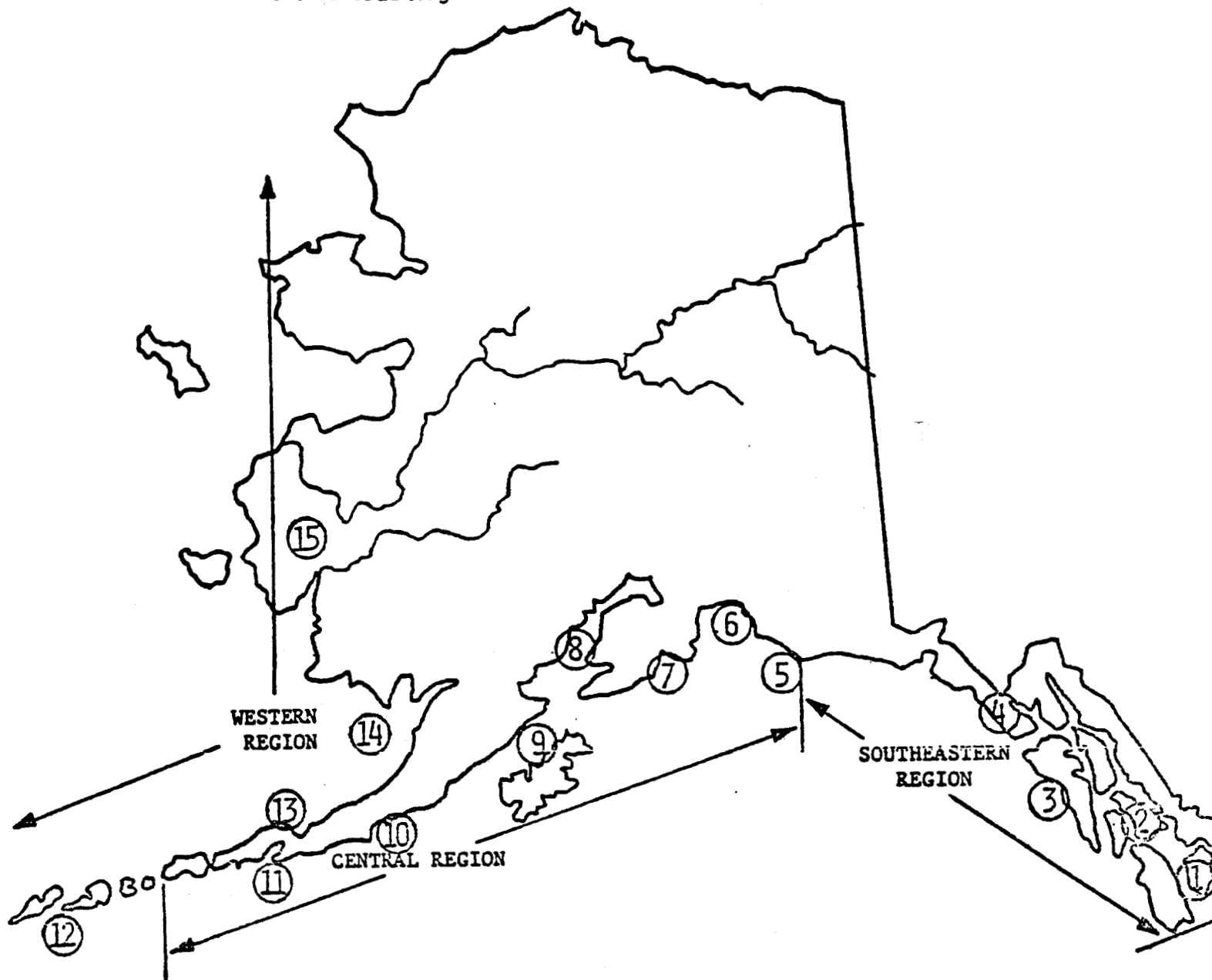
^{a/} The age classes listed for each species generally comprise more than 90% of the run.

The boundaries of and major fishing areas in the Southeastern, Central and Western statistical regions are shown in Figure 1. These regions and areas are the ones used in the Department's statistical leaflet series and in prior statistical reports.

Acknowledgments

Materials presented in this report were prepared by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists,

Figure 1. Alaska Department of Fish and Game Commercial Fisheries Statistical Regions.



REGIONS:

SOUTHEASTERN ALASKA: Dixon Entrance to Cape Suckling
CENTRAL ALASKA: Cape Suckling to Scotch Cap on the southwestern tip of Unimak Island
WESTERN ALASKA: The Aleutian Islands west of Scotch Cap and the Bering Sea north through Kotzebue Sound

AREAS:

- | | | |
|------------------------|--------------------|--------------------------|
| ① Ketchikan | ⑥ Prince Wm. Sound | ⑪ South Peninsula |
| ② Petersburg-Wrangell | ⑦ Resurrection Bay | ⑫ Aleutian Islands |
| ③ Sitka | ⑧ Cook Inlet | ⑬ North Peninsula |
| ④ Juneau-Yakutat | ⑨ Kodiak | ⑭ Bristol Bay |
| ⑤ Copper-Bering Rivers | ⑩ Chignik | ⑮ Arctic-Yukon-Kuskokwim |

not individually identified, contributed the materials for the review of the 1977 fishing season. Individual credit for forecast material is given with the area forecast discussions in Appendix A.

REVIEW OF THE 1977 SEASON

A preliminary estimate of the 1977 Alaskan commercial salmon harvest is 49.6 million fish, the largest since 1970. Again, as in 1976, the catch exceeded its immediately preceding 10 year's average (see Figure 2).

The harvest was above the upper limit of the projected range of 23 to 46 million fish issued by the Department in 1976. Statewide, catches of every species were better than had been anticipated. In Southeast Alaska, the chum catch was about 30% below the projection, but pink and sockeye harvests were twice as large as had been expected. Strong sockeye, pink and chum returns to Cook Inlet systems, and better than expected Chignik sockeye and pink runs boosted the Central Region harvest about 20% over projections. Harvests of chum, sockeye and coho salmon were unexpectedly large in Bristol Bay, and the Western Region projection was exceeded by 60%. Table 2 compares 1977 return forecasts for individual areas and species with preliminary estimates of the actual returns, and Table 3 gives a breakdown of the harvest by species and area.

Southeastern Alaska

The 17 million pink salmon return to southern Southeast Alaska was the largest odd-numbered year run since 1951. Pink escapements to southern Southeastern streams were good in 1975, and survival was better than average. Because of the unexpectedly large pink return, gill net fishing in District 1 and the District 4 seine fishery remained open; catches of both sockeye and pink salmon were high. Sockeye harvests were also well above average in the Yakutat set net fishery and other Southeastern drift gill net areas. A very strong return of pink salmon to the Sitka area resulted in a harvest of nearly 2 million pinks there by purse seine fishermen. Pink escapements in southern districts were near goals and well distributed. Pink escapements were very heavy in the Sitka area, and improved in comparison with the parent year (1975) in all districts. Overall, however, northern Southeast escapements were poorly distributed and less than half of desired levels in some areas.

Coho abundance was below average, and outside troll catches were poor. The inside troll and incidental net coho harvest was average or above because of increased fishing effort. Trollers along the outside coast north of Sitka experienced exceptional chinook salmon fishing for most of the season.

Chum salmon returns were poor throughout Southeastern Alaska in 1977.

Figure 2. 1960-77 Alaskan commercial salmon harvest and preceding 10 year's average.

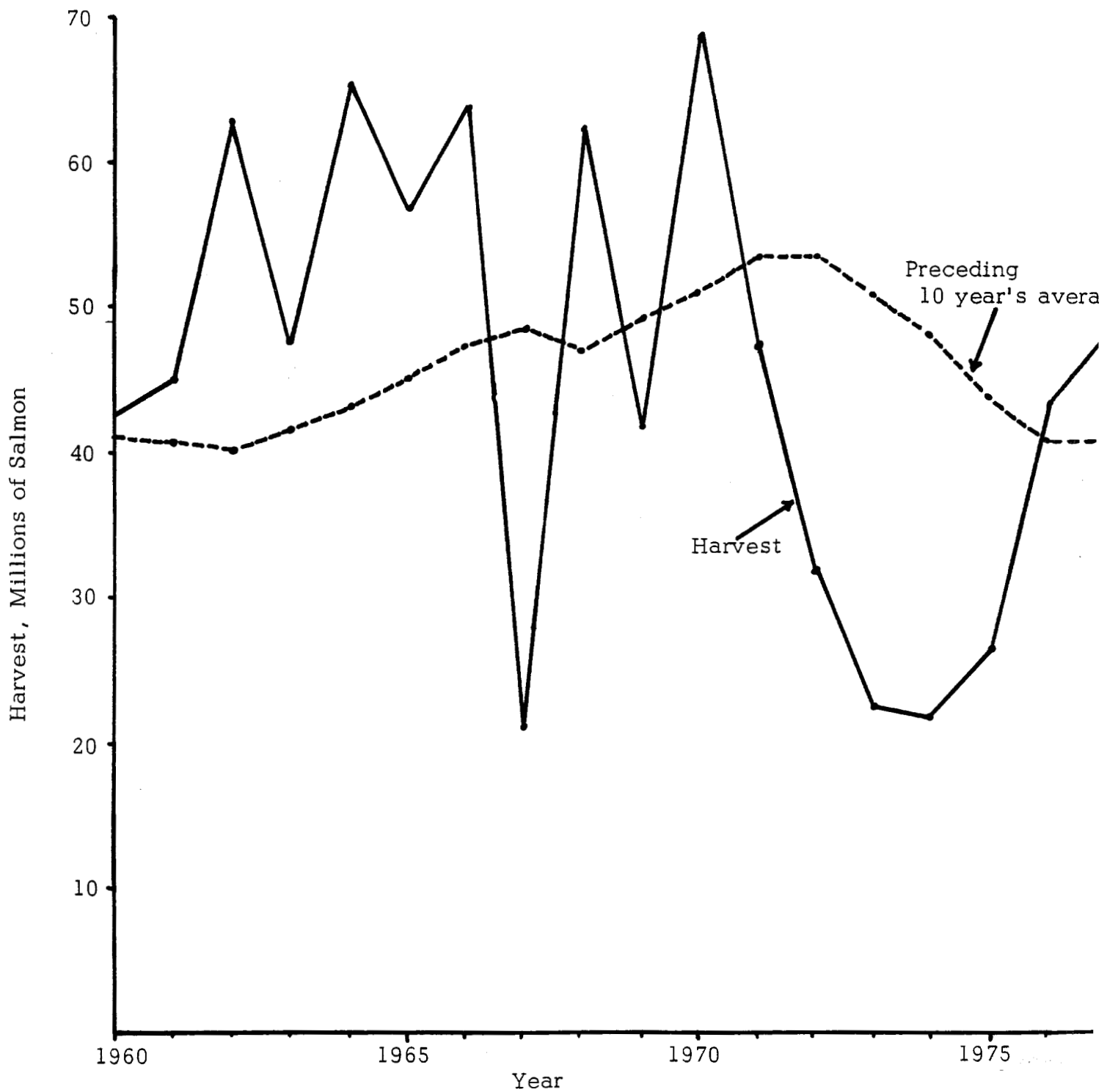


TABLE 2. COMPARISON OF ACTUAL ^{a/} AND FORECAST 1977 SALMON RETURNS, WITH ABSOLUTE AND RELATIVE ERRORS, FOR SOME MAJOR ALASKAN SALMON FISHERIES ^{b/}.

(Number of fish in thousands)

Area	Species	(1) Harvest ^{a/}	(2) Escapement ^{a/}	(3) Return ^{a/} (1) + (2)	(4) Forecast return	(5) Error: (4) - (3)	(6) Relative Error: (5)/(3) X 100%
Southern Southeastern	Pink	11,200	5,500	16,700	12,000	-4,700	-28%
Northern Southeastern	Pink	2,300	3,800	6,100	2,900	-3,200	-52%
Southeastern Subtotal	Pink	13,500	9,300	22,800	14,900	-7,900	-35%
Prince William Sound	Pink	4,500	1,700	6,200	6,300	100	+2%
	Chum	570	145	715	750	35	+5%
Cook Inlet-Southern and Outer Districts	Pink	1,340	360	1,700	850	-850	-50%
Kodiak	Pink	6,270	2,240	8,510	8,600	90	+1%
Chignik	Sockeye	1,960	730	2,690	1,950	-740	-28%
	Pink	590	750	1,340	750	-590	-44%
Bristol Bay	Sockeye	4,710	4,810	9,520	8,400	-1,120	-12%
	Pink ^{c/}	-	-	-	-	-	-
South Peninsula	Pink	1,360	1,660	3,020	1,150	-1,870	-62%
Total		34,800	21,695	56,495	43,650	-12,845	-23%

^{a/} Preliminary data

^{b/} Compiled 12/10/77

^{c/} Bristol Bay pink runs are negligible in odd years.

TABLE 3. PRELIMINARY 1977 ALASKA COMMERCIAL SALMON HARVEST BY SPECIES AND FISHING AREA ^{a/}.

(Number of fish in thousands)

AREA	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southern Southeastern	156	568	306	11,200	359	12,589
Northern Southeastern	152	243	359	2,183	265	3,202
Yakutat	2	184	83	75	8	352
SOUTHEASTERN REGION SUBTOTAL	310	995	748	13,458	632	16,143
Prince William Sound	23	940	180	4,532	571	6,246
Cook Inlet	14	2,114	193	1,827	1,365	5,513
Kodiak	1	624	24	6,274	1,071	7,994
Chignik	1	1,960	17	593	120	2,691
South Peninsula	1	273	0	1,362	264	1,900
CENTRAL REGION SUBTOTAL	40	5,911	414	14,588	3,391	24,344
North Peninsula	5	417	28	0	101	551
Aleutian Islands	0	0	0	0	0	0
Bristol Bay	132	4,707	100	2	1,599	6,540
Arctic-Yukon-Kuskokwim	159	19	303	50	1,454	1,985
WESTERN REGION SUBTOTAL	296	5,143	431	52	3,154	9,076
TOTAL ALASKA	646	12,049	1,593	28,098	7,177	49,563

^{a/} Compiled 12/10/77

All Southeastern salmon species averaged 1 to 3 pounds heavier than normal in 1977, apparently because of good ocean feeding conditions during the past year.

Prince William Sound

The pink and chum salmon purse seine fishery in Prince William Sound began early, in late June. Early and middle runs produced the majority of the 4.5 million pink catch. Returns from both of these species were quite close to pre-season forecasts. Sockeye returns to the Coghill-Unakwik District were strong, with a harvest of 180,000 and a good escapement to Coghill River. The Eshamy District sockeye return was weaker than expected, however, and was closed in early August.

Because Copper and Bering River sockeye runs appeared a week to 10 days early, and because price disputes between fishermen and processors were not resolved until after the season opened, early portions of the runs were not fished. The Copper River sockeye harvest was near average, with excellent upriver escapements. The Bering River harvest was considerably below average; sockeye returns were weak as had been expected. Coho catches for both rivers were normal, and escapements appeared good. Like the sockeye run, the Copper River chinook run was early, but the total catch of 22,000, which is incidental to the sockeye harvest, was about 20% above average.

Cook Inlet

A total 1977 commercial harvest of more than 4 million salmon in upper Cook Inlet was the largest since 1968, and established a new odd-numbered year record. Sockeye, pink and chum salmon returns were all very strong. The sockeye catch of 2 million was the largest since 1951 and the Kenai River sockeye escapement was the highest on record.

The 1.3 million pink salmon catch in lower Cook Inlet was more than twice the long term average. The total return, 1.7 million, exceeded the upper limit of the forecast range by more than 20%. Sockeye and chum harvests were also unexpectedly high, as in the upper Inlet. Pink, sockeye and chum escapement goals were achieved in all major districts. Port Dick Bay, in the Outer District, was the mainstay of the large 1977 pink return, with a catch of 900,000.

Kodiak

Nearly 8 million salmon were harvested in the Kodiak area in 1977. The total pink return of 8.5 million was only 1% less than the pre-season forecast.

Pink escapements were the highest on record for an odd-numbered year, at 2.2 million, and escapement distribution was excellent.

Sockeye and chum harvests were also above average for recent years. Very good chum escapements were achieved while allowing a large catch of 1.1 million.

Chignik

Both Chignik sockeye runs, particularly the late run, were very strong, with a Chignik area harvest of 2.0 million, the second highest in history, and 160,000 in other areas. Escapement goals were met for both runs. Both runs were early. The 1977 pink run was the largest since 1969, and an excellent escapement of 750,000 was achieved. The catch of 600,000 came primarily from the Western District and the Kujulik section of the Eastern District. Chum returns were mixed, with a catch of 110,000 and near-average escapements. The coho harvest of 17,000 was slightly above average.

South Peninsula

Fisheries in the Shumagin Islands and at South Unimak took 240,000 sockeye, only slightly more than the quota set by the Board of Fisheries. Chum salmon were less abundant than usual; the incidental catch was about 100,000. The sockeye catch in the Southeastern District was also slightly below average, as was the South Peninsula chum run, although chum escapements were good.

The pink return exceeded the upper limit of the forecast range by about 300,000 fish. Strong escapements were obtained. Although pink escapements were good to excellent in Shaishnikof River at Unalaska Bay, runs were weak in Makushin Bay. There was no commercial fishery in the Aleutians in 1977.

North Peninsula

North Peninsula sockeye runs were again strong in 1977 with a 500,000 catch. Escapements were generally quite good. Although chum returns to many North Peninsula areas were unusually strong, the catch was only average because of poor fishing conditions and late development of the runs.

Bristol Bay

The inshore return of 9.5 million sockeye salmon to Bristol Bay in 1977 exceeded the forecast return by about 10%, and the 4.7 million sockeye harvest was nearly twice as large as anticipated. Escapement goals were achieved in most major systems, with shortages occurring only in the Kvichak and Ugashik Rivers.

The chinook salmon catch of 130,000 was the largest since 1970, and the 1.6 million chum salmon harvest was the highest on record. Escapements were excellent. Late fishing effort for coho salmon increased in 1977, and the resultant catch of 100,000 was over twice the long term average.

Arctic-Yukon-Kuskokwim

A 1977 commercial harvest of 2.0 million salmon was the third largest ever recorded in the Arctic-Yukon-Kuskokwim Region. Chinook catches, mostly from the Yukon and Kuskokwim, totaled 160,000, only slightly below the record. The Kuskokwim coho run was also large, and the region-wide catch of 300,000 exceeded the previous high by more than 100,000 fish. Harvests of other species were close to recent levels. Chinook and summer chum escapements ranged from average to above average.

PRELIMINARY FORECASTS OF THE 1978 SALMON RETURNS TO SELECTED ALASKAN FISHERIES

The Department's salmon management program includes a number of salmon return forecast projects. Forecast fisheries were selected using several criteria, including economic importance, feasibility, compatibility with existing programs and management needs. Forecast fisheries are:

Southern Southeast	-	pink salmon
Northern Southeast	-	pink salmon
Prince William Sound	-	pink and chum salmon
Cook Inlet: Southern and Outer Districts	-	pink salmon
Kodiak	-	pink salmon
Chignik	-	pink and sockeye salmon
South Peninsula	-	pink salmon
Bristol Bay	-	pink and sockeye salmon

In 1977, more than two-thirds of the total statewide salmon harvest was taken in these fisheries.

A variety of information is used to make salmon return forecasts, including escapement magnitudes and distribution, survival to intermediate life stages and population age composition. The return, with upper and lower limits, is predicted for each forecast fishery. In general, based on past experience, the actual return can be expected to fall inside the range (between the lower and upper limits) about 50% of the time. In 1977, 5 of the 10 returns forecast were inside their forecast ranges. However, the southern Southeast, Prince William Sound, Kodiak and Cook Inlet pink salmon forecast ranges are 80% confidence intervals. The 1978 forecasts and ranges are summarized in Table 4.

Southeastern Alaska

Pink salmon runs in the southern districts have recovered from the effects of severe winters in 1970-71 and 1971-72. The highest parent escapements since 1971 and mild weather should allow a harvest of from 11 to 21 million. Although 1976 pink runs in northern districts were stronger, escapements were very low and uneven in distribution. Harvestable surpluses are expected in a few areas, with a total northern Southeastern pink catch of from 800,000 to 3.6 million.

Prince William Sound

The expected harvest of pink salmon in Prince William Sound is 3.2 million, including an estimated 200,000 pinks returning to the Prince William Sound Aquaculture Corporation's hatchery on Evans Island. However, the catch might be as small as 1.6 million, or as large as 4.8 million. Not all districts will have returns in excess of escapement requirements.

Although the forecast catch of chum salmon in Prince William Sound is 400,000, it could range from negligible to nearly 700,000.

Cook Inlet -- Southern and Outer Districts

The majority of the pink salmon return to the Southern and Outer Districts of Cook Inlet in 1978 is expected to be to the Outer District, and fishing will probably be limited to that District. The forecast catch of 500,000 includes 14,000 returning pinks reared in Halibut Cove and 86,000 from the Tutka Lagoon hatchery. The total harvest range is from 90,000 to 1.0 million pink salmon.

Kodiak

Better than average escapements in 1976 should yield a 1978 harvest of from 9.1 to 13.7 million pink salmon in the Kodiak area. The forecast return is 14.1 million and 2.7 million are needed for brood stock.

TABLE 4. PRELIMINARY FORECASTS OF SALMON RETURNS TO SOME MAJOR ALASKAN FISHERIES IN 1978.

(Number of fish in thousands)

AREA	Species	Forecast return	Escapement goal	Estimated harvest	Forecast a/ return range	Estimated harvest range
Southern Southeastern	Pink	22,100	6,000	16,100	17,200-27,000	11,200-21,000
Northern Southeastern	Pink	5,000	4,000	2,200	3,000- 5,000	800- 3,600
Southeastern Total	Pink	27,100	10,000	18,300	20,200-34,000	12,000-24,600
PWS Natural	Pink	4,200	1,200	3,000	2,700- 5,700	1,500- 4,500
PWS Supplemental	Pink	223	25	198	143- 303	118- 278
Prince William Sound Total	Pink	4,423	1,225	3,198	2,843- 6,003	1,618- 4,778
	Chum	640	250	390	280- 920	30- 670
CI Natural	Pink	535	215	409	180- 1,100	64- 826
CI Supplemental	Pink	100	10	90	34- 210	24- 200
Cook Inlet-Southern and Outer Districts Total	Pink	635	225	499	214- 1,310	80-1,100
Kodiak	Pink	14,100	2,700	11,400	11,800-16,400	9,100-13,700
Chignik	Pink	2,700	580	1,975	1,800- 3,700	1,000- 2,900
	Sockeye	1,725	650	1,075	1,300- 2,150	650- 1,500
South Peninsula	Pink	4,300	1,100	3,200	3,300- 5,500	2,200- 4,400
Bristol Bay, Nushagak District	Pink	3,200	800	2,400	2,000- 4,000	1,200- 3,200
Bristol Bay	Sockeye	11,500	5,500	6,300	7,000-16,000	1,500-10,500
TOTAL		70,323		48,737		

a/ The forecasted return and harvest ranges are estimated by several techniques.

b/ Inshore harvest only.

Chignik

The forecast pink salmon return to the Chignik area is 2.7 million, with the expected catch ranging from 1 to 2.9 million. About 1.7 million sockeye are forecast, with a 650,000 to 1.5 million harvest.

South Peninsula

High pre-emergent fry indices on the south side of the Alaska Peninsula suggest the minimum harvest of pink salmon will be 2.2 million. It may be as high as 4.2 million.

Bristol Bay

About 11.5 million sockeye salmon are forecast to return to Bristol Bay in 1978. Only the Ugashik River run is expected to be weak. The sockeye harvest could range from 1.5 to 10.5 million. Nushagak District pink salmon brood-year escapements were near optimal levels and well distributed, and early survival appeared good. The pink harvest is estimated at 2.4 million, with a 1.2 to 3.2 million range.

PROJECTED 1978 ALASKAN COMMERCIAL SALMON HARVESTS

Projections of the 1978 Alaskan commercial salmon harvest by statistical region and species are presented in Table 5. The projections are composed of forecast harvests and harvest projections (recent harvest averages, sometimes modified if additional information is available), for fisheries without forecasts. Chinook and coho returns are not forecast in any region, and Prince William Sound, in the Central Region, has the only chum forecast. All regions have pink salmon forecasts, but several smaller pink runs are not forecast. Major sockeye runs in the Central and Western Districts are forecast; important exceptions are Copper River, Cook Inlet and Kodiak. Despite these gaps, 70% of the 1977 salmon harvest was taken in forecast fisheries.

The 1978 statewide total commercial harvest projection is 62.9 million salmon.

Species Outlook

Pink Salmon

70% of the 1978 statewide total harvest projection, or 44.1 million fish

57% of the 1977 statewide total harvest, or 28.1 million fish

TABLE 5. PRELIMINARY PROJECTIONS OF 1978 ALASKAN COMMERCIAL SALMON HARVESTS BY REGION AND SPECIES, AND PROJECTED STATEWIDE SALMON PRODUCTION BY SPECIES a/.

(Number of fish in thousands)

STATISTICAL REGION	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	240	650	800	18,300	900	20,890
Central	30	3,990	430	22,800	2,530	29,780
Western	250	6,440	270	3,020	2,280	12,260
TOTAL ALASKA	520	11,080	1,500	44,120	5,710	62,930
Total production, thousands of pounds <u>b/</u>	6,450	46,540	8,700	101,480	30,260	193,430

a/ Compiled 11/3/77 . The projected 1977 harvests were obtained by summing harvest forecasts (Table 4) and harvest projections in the remaining fisheries.

b/ Including canned, cured, fresh and frozen salmon.

Pink salmon catches are expected to increase in all regions, raising the pink contribution to the harvest of all species from 57% to 70%. The projected pink salmon increase, from 28 million in 1977 to 44 million in 1978, is nearly 60% above the 1977 statewide pink harvest. This compares with a projected 14% decline in the statewide harvest of other species.

Particularly noteworthy increased harvests are expected in southern Southeast (54%), Kodiak (82%) and South Peninsula (135%) pink stocks. Declines are expected in Prince William Sound, Lower Cook Inlet and Chignik.

Sockeye Salmon

18% of the 1978 statewide total harvest projection, or 11.1 million fish

24% of the 1977 statewide total harvest, or 12.0 million fish

The projected sockeye salmon harvest, about 11 million fish statewide, is almost unchanged from the 1977 catch. The forecast 34% increase in Bristol Bay over the 1977 harvest of 4.7 million is expected to be offset by decreases in the Central and Southeastern Regions. Because of the large projected pink catch, the contribution of sockeye salmon to the statewide total harvest is expected to decline from 24% in 1977 to 18% in 1978.

Chum Salmon

9% of the 1978 statewide total harvest projection, or 5.7 million fish

15% of the 1977 statewide total harvest, or 7.2 million fish

Poorer catches of chum salmon are anticipated in all regions. Statewide, a 20% decrease is projected. Although 1977 chum returns were weak in Southeastern Alaska, they were generally exceptionally strong in other areas.

Coho Salmon

2% of the 1978 statewide total harvest projection, or 1.5 million fish

3% of the 1977 statewide total harvest, or 1.6 million fish

Chinook Salmon

1% of the 1978 statewide total harvest projection, or 500,000 fish

1% of the 1977 statewide total harvest, or 650,000 fish

Harvests of coho and chinook are projected at levels near those achieved in 1977. Moderate decreases in chinook catches are expected in all regions.

Regional Outlook

Statewide

1978 statewide total harvest projection: 62.9 million fish

1977 statewide total harvest: 49.6 million fish

A 57% increase in pink salmon harvests accompanied by a 14% decrease in catches of other species is expected to result in a 27% increase in the 1978 statewide salmon harvest.

Southeastern Region

33% of the 1978 statewide total harvest projection, or 20.9 million fish

33% of the 1977 statewide total harvest, or 16.1 million fish

Catches of pink salmon are expected to increase by more than 50% in southern Southeast Alaska, but to decrease in northern districts. Harvests of other species are projected to decline slightly or remain unchanged.

Central Region

47% of the 1978 statewide total harvest projection, or 29.8 million fish

49% of the 1977 statewide total harvest, or 24.3 million fish

In the Central Region, large increases in pink salmon harvests are forecast in Kodiak and the South Peninsula. Moderate declines are anticipated in sockeye and chum catches.

Western Region

20% of the 1978 statewide total harvest projection, or 12.3 million fish

18% of the 1977 statewide total harvest, or 9.1 million fish

Odd-numbered year pink catches are almost negligible in the Western Region; a harvest of 3 million pinks is projected in 1978. An increase of 25% is anticipated in the sockeye catch, but harvests of other species are expected to show small to moderate declines.

DISCUSSION

Alaskan commercial salmon harvests have been consistently increasing since the disastrous 1974 catch of 22 million fish. Yet another increase, from 49 million salmon in 1977 to 63 million in 1978, is projected. It is important to note, however, that the 1978 harvest might fall as low as 40 million, if pink returns to southern Southeast Alaska, Kodiak and the South Peninsula do not materialize at expected strengths. All available evidence suggests that salmon runs in most areas have largely recovered from the effects of hard winters in 1970-71 and 1971-72, to population levels of the 1960's, and it is unlikely that the 1978 harvest will be less than 40 million.

The Department's salmon harvest projection has been too conservative every year since 1974. Extrapolation of this trend would suggest that a harvest of 90 million salmon or more could occur. It should be remembered, however, that Department projections were generally too optimistic in the early 1970's, and that, overall, harvest projections appear to be unbiased.

It is also notable that significant projected 1978 harvest increases are limited to pink salmon, in southern Southeast Alaska, Kodiak and the South Peninsula. Although the Bristol Bay sockeye catch is expected to be moderately larger, other harvests may decline or remain near recent levels.

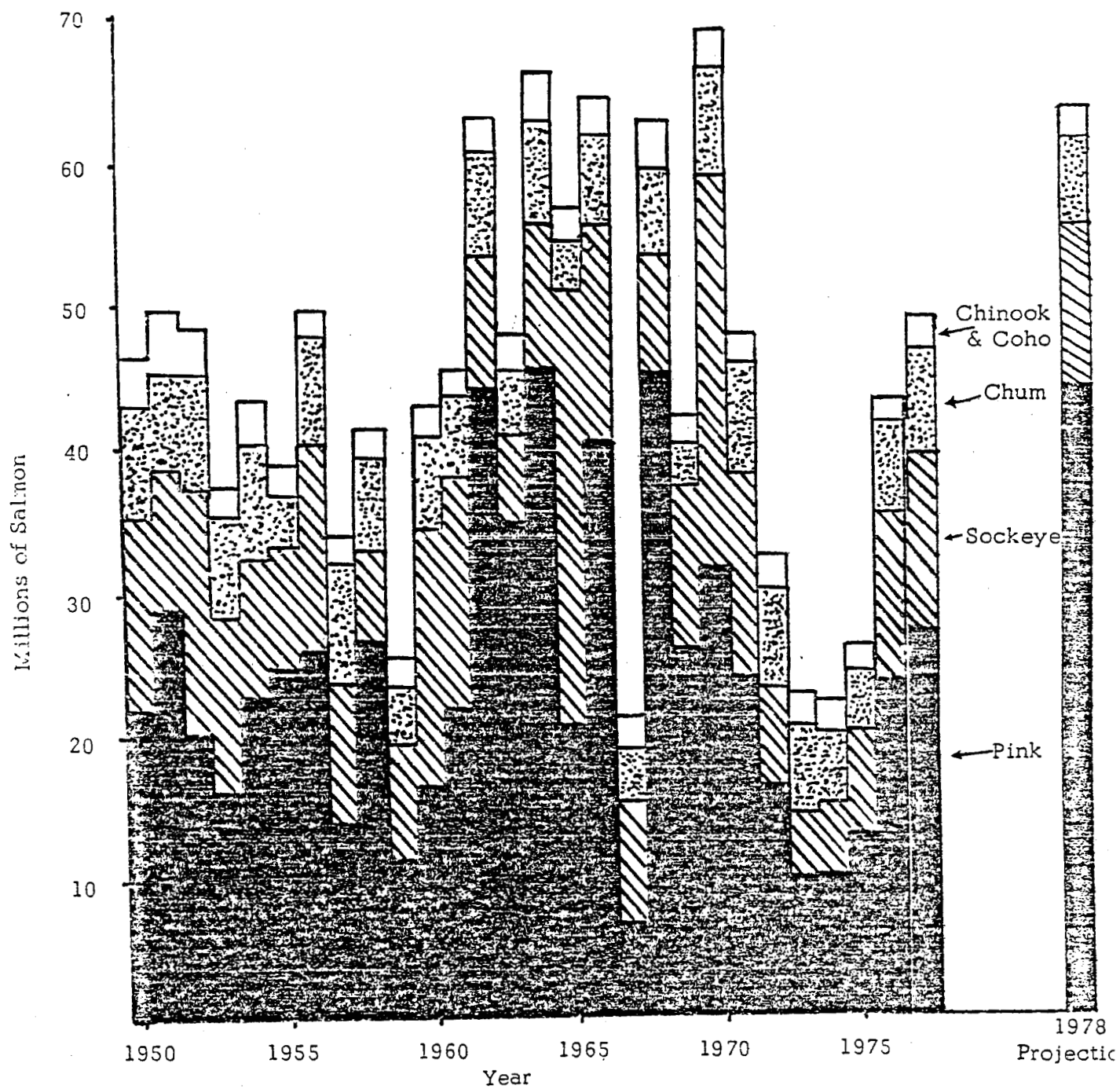
Catches through the 1960-70 period averaged over 50 million salmon per year statewide. Despite the generally good escapement levels realized in the late 1960's, poor salmon survival due to extremely harsh climatological conditions during the winters of 1970-71 and 1971-72 precipitated a disastrous decline in salmon runs throughout the state. Harvests from 1971 through 1975 averaged only 30 million salmon per year with a low of 22 million in 1974. In 1976 fishermen harvested 44 million salmon statewide, a definite improvement over the previous four year period. While one or two years comprise too short a period to indicate a trend, the 1977 harvest and escapements and 1978 projections both substantiate an optimistic outlook.

Especially gratifying is the apparent recovery of pink and chum salmon runs in the Chignik-South Peninsula areas, sockeye runs in Bristol Bay, pink salmon runs in southern Southeast Alaska and some improvement in the status of northern Southeast pink salmon stocks. Pink and chum salmon runs in the Chignik-South Peninsula area had declined to nearly total closure levels starting in 1972. Catches and escapements continued to be minimal through 1975 and it was not apparent that these stocks would recover without supplemental production assistance. However, in 1976 harvests of both pinks and chums improved to nearly pre-1972 abundance, and escapements were generally good. This trend continued in 1977 and is expected to be maintained in 1978.

Short and long term projections of Bristol Bay sockeye runs, based on generally good escapement numbers and distribution from 1974 through 1977 and indications of at least average survival, point to a return to harvest levels realized in the 1960s. Pink salmon stocks in southern Southeast Alaska have increased dramatically. In 1978 a further increase is predicted. The northern Southeast pink runs remain depressed although 1977 escapements to all districts were improved over the parent year (1975).

The precipitous decline in salmon harvests experienced in the early 1970s, followed by the more recent rapid rebound to higher levels, reflects the quick response of Department fisheries managers to the debilitating effects of harsh winters in 1970-71 and 1971-72 (see Figure 3). This response involved a considerable sacrifice on the part of fishermen and industry. Harvests on weak salmon returns from these brood years were restricted to obtain at least minimal escapements. Recent mild winter and spring weather has helped to speed the recovery of many Alaskan salmon populations, and continued careful management promises to yield further increases in the future.

Figure 3. Alaskan salmon harvest by species, 1950-1977 and 1978 projected harvest.



APPENDIX A. FORECAST METHODS AND DISCUSSIONS

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Southern Southeastern

Point Estimate: 22.1 million

Range Estimate: 17.2 million - 27.0 million

Northern Southeastern

Point Estimate: 5.0 million

Range Estimate: 3.0 million - 7.0 million

Total Southeastern

Point Estimate: 27.1 million

Range Estimate: 20.2 million - 34.0 million

FORECAST METHODS

Separate forecasts of pink salmon returns to southern and northern Southeastern have been calculated because of differences in migration routes and abundance trends of pink salmon stocks from the two segments. The 1978 southern unit forecast is based on a multiple linear regression of parent year escapements, winter air temperatures and adult returns. Estimates generated from that method fit the previous returns better than estimates from several other models using pre-emergent fry indices and sea surface or air temperatures. The forecast range is an 80% confidence interval about the predicted return.

The 1978 northern Southeastern forecast was calculated from parent year escapements and spawner return ratios. Other forecast equations using escapement indices, pre-emergent fry indices and air or sea surface temperatures were examined and rejected. Enhanced freshwater and marine survival is expected to partially offset the effects of the lowest parent year escapement in the northern unit since 1960.

In the preparation of both southern and northern Southeastern forecasts, the data of the previous three seasons was given special attention because of apparent changes in spawner distribution, run timing and survival factors.

DISCUSSION OF THE 1978 FORECAST

Pink salmon runs in the southern districts have shown definite signs of improvement in the past two seasons. The escapement index in the parent year of the 1978 return (i.e. 1976) and the resultant pre-emergent fry index were the highest since the 1971 brood. Climatic factors during incubation, emergence and early marine growth appear to have been at least as favorable as those associated with the strong 1977 return. In 1978 the runs to Districts 1, 2 and 7 are expected to be particularly strong, although harvestable surpluses are foreseen in all districts. Poor or fair runs are expected in certain areas, specifically San Alberto and Cordova Bays in District 3, the southern half of District 5 excluding Affleck Canal and District 6A. The 1978 return should be well spread throughout the season with the peak of fishing in early August; however, timing could be modified by climatological factors.

Pink salmon runs in most northern districts improved considerably in 1977 and the freshwater and early marine survival conditions for the 1978 return appeared to be equally good. However, the 1976 escapement index of about 1.1 million was the lowest since 1960 and the pre-emergent fry index was also low. A very favorable return per index spawner of 4.5:1 would result in a return of 5 million in 1978. In comparison, the return per spawner this past season in northern Southeast was about 3.2:1 and the average ratio from 1960 through 1977 is 2.9:1. An extremely high ratio of 6.2:1 would produce a 7 million fish return and a moderate ratio of 2.7:1 would produce a 3 million fish return.

Northern Southeastern pink salmon stocks have generally been at a very low level of abundance and the 1978 return is expected to be distributed very unevenly. Harvestable surpluses may occur in Peril Strait, Hoonah Sound, Tenakee Inlet, Tebenkof Bay and Slocum Arm. At the opposite extreme, the District 11 and 14 stocks have been critically weak and are expected to be low again in 1978. Returns to the majority of streams (those in District 10 and the remaining portions of Districts 9, 12, and 13) are not expected to exceed escapement needs. Timing of the 1978 return is likely to be spread over the early, middle and late run segments.

Prepared by: Alan P. Kingsbury
Fisheries Research Biologist
Juneau

FORECAST AREA: Cook Inlet - Southern and Outer Districts

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Natural Production

Point Estimate: 535,000

Range Estimate: 180,000 - 1.1 million

Supplemental Production

Point Estimate: 100,000

Range Estimate: 34,000 - 210,000

Total Production

Point Estimate: 635,000

Range Estimate: 210,000 - 1.3 million

FORECAST METHODS

The 1978 pink salmon forecast for the Southern and Outer Districts of Cook Inlet is derived from the relationship between pre-emergent fry densities and subsequent return. Indices of pre-emergent abundance from nine major spawning streams are obtained in the spring prior to fry emergence and are weighted by the average escapement for that stream. The resultant individual stream indices are combined to derive a single weighted pre-emergent fry index for all nine streams. This index is used with standard linear regression methods to calculate the forecast.

A new dimension has been added to the pink salmon forecast due to the operation of the Tutka Lagoon pink salmon egg hatchery and Halibut Cove salt water rearing facilities. Separate forecasts of returning adult pink salmon have been made for each facility, using expected survival rates.

DISCUSSION OF THE 1978 FORECAST

The 1976 pink salmon escapement of 87,000 was less than half the even-year escapement goal of 215,000. Over 80 percent of the escapement occurred to streams in the Southern District and it is expected that the majority of the 1978 return will be to this district.

Although good escapements were achieved in the major spawning streams of the Southern District in 1976, pre-emergent fry indices were lower than expected due to severe flooding and stream scouring which occurred in September. However, mild winter weather, early spring breakup and warm water conditions could have increased the survival of rearing pink salmon fry in 1977.

Computations for the 1978 forecast give a total return of 534,900. Calculations for the Tutka Lagoon and Halibut Cove forecasts are outlined below:

	<u>Number of Fry Released</u>	<u>Estimated Marine Survival</u>	<u>Estimated Adult Return</u>
Halibut Cove	342,000 (Reared)	4%	13,700
Tutka Lagoon	4,294,000	2%	<u>85,900</u>
			99,600

The total pink salmon forecast for the Southern and Outer Districts is 635,000 with a range of from 210,000 to 1.3 million. Pink salmon are not expected to return in harvestable numbers to several spawning areas, and the escapement goal of 126,000, to those systems having harvestable returns, should allow a commercial catch of from 80,000 to 1.1 million pink salmon.

The average return per spawner of 4.41 indicates a total return of only 482,000, including hatchery and salt water reared salmon returns. Most commercial fishing will take place in the Southern District. The Outer District will probably remain closed for most of the season.

Prepared by: Thomas R. Schroeder
Area Biologist
Homer

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Natural Production

Point Estimate: 4.2 million

Range Estimate: 2.7 million - 5.7 million

Supplemental Production

Point Estimate: 223,000

Range Estimate: 143,000 - 303,000

Total Production

Point Estimate: 4.4 million

Range Estimate: 2.8 million - 6.0 million

FORECAST METHODS

Prince William Sound pink salmon forecasts are based on pre-emergent fry indices obtained from a standard list of streams and sample zones. Linear regression analysis is used with pre-emergent fry densities from the brood year to establish the point and range estimates for the adult return. For the first time in the forecast program the forecast is based on even years only, 1966-1976. The reasoning for this is based on even and odd-year spawner distributions. The even-year run spawner distribution averages 75% intertidal and 25% freshwater, while the odd-year run is 50% intertidal and 50% freshwater. These differences in distribution influence egg-to-fry survival, pre-emergent fry index sample schemes and pre-emergent fry index weighting methods. In addition, even-year production was drastically lowered by the tectonic effects of the 1964 Alaska earthquake while the odd-year run has remained relatively unaffected.

During the spring of 1977, the Prince William Sound Aquaculture Corporation's hatchery in San Juan, Evans Island produced an estimated 10.5 million pink salmon fry. Of these, 1.3 million fry were penned and fed in saltwater. A small portion of the remainder was held and fed in freshwater tanks located within the hatchery and the rest were released into the estuary adjoining the hatchery. The fry held and fed in the saltwater pens exhibited good feeding habits and growth.

The 1978 adult return was calculated as follows:

1. Estimated survival rate for fry held and fed in saltwater = 3%.
2. Estimated survival rate for fry released to feed in the estuary = 2%.

Therefore:

1. Return from fry fed in saltwater:

$$(1.3 \text{ million}) (0.3) = 39,000 \text{ adults,}$$

2. Return from fry released into the estuary:

$$(9.2 \text{ million}) (.02) = 184,000 \text{ adults,}$$

and the total estimated hatchery return is 223,000 adults.

DISCUSSION OF THE 1978 FORECAST

Returns of naturally produced pink salmon in 1978 are the progeny of the 1976 estimated pink escapement of 866,000. The resultant pre-emergent fry index was 239 fry per square meter. Based on even-year returns (1966 to 1976) the calculated return for this fry density is 4.2 million fish. The range, from 2.7 to 5.7 million fish, is an 80% confidence interval based on the exhibited variability between past even-year forecasts and the actual returns.

The commercial harvest point estimate for natural production is 3.0 million fish with a range of 1.5 million to 4.5 million. These figures are based on estimated escapement requirements of 1.2 million fish.

Brood-year escapement levels and pre-emergent fry magnitudes both strongly suggest that harvestable levels of pinks will be destined only for the Eastern, Northern and Coghill Districts.

Return timing is expected to be skewed toward the early and middle portions of the run. However, some streams in the Eastern District may also produce strong late runs. This conclusion is based on the run timing experienced in 1976.

Harvestable levels of hatchery returns are expected to be available from late July to mid-August. If the forecast return of 223,000 fish is realized then about 200,000 fish should be available for harvest. The aquaculture corporation will require 25,000 fish to reseed its hatchery to a level of 25 million pink eggs.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 640,000

Range Estimate: 280,000 - 920,000

FORECAST METHODS

Methods used to forecast chum salmon are similar to those used for pink salmon. However, the chum salmon forecast is based on 4-year-old fish. After the 4-year-old forecast is calculated it is increased to include all age classes by dividing the 4-year-old estimate by the average 4-year-old contribution to annual returns. This contribution averages 75% of the total return. Other age classes contributing to annual returns are 3, 5 and, to a small extent, 6 years of age.

DISCUSSION OF THE 1978 FORECAST

The major portion of the return forecast for 1978 is from the 1974 brood year escapement of 195,000. This brood year escapement produced a pre-emergent fry index of 81 fry per square meter. This index gives a forecast return of 640,000 fish with a range of from 280,000 to 920,000 at the 80% confidence level.

The commercial harvest point estimate is 390,000 with a range of 30,000 to 670,000. The harvest point and range is based on a desired estimated escapement level of 250,000 fish.

Escapement and pre-emergent fry levels suggest that the vast majority of the return will be of Eastern, Northern and Coghill District stream origin. Stocks destined for the Northwestern District should also contribute to the return.

Prepared by: Michael L. McCurdy
Fisheries Research Biologist
Cordova

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 14.1 million

Range Estimate: 11.8 - 16.4 million

FORECAST METHODS

The 1978 pink salmon forecast return to the Kodiak management area was determined as follows: For the Kodiak-Afognak Island complex a linear regression using thirteen consecutive years of raw pre-emergent fry densities and subsequent adult returns was used to establish the point estimate; the range estimate is an 80% confidence interval about the point estimate. For the Mainland District, where pre-emergent fry data isn't as complete, a simple return per spawner ratio was used; specifically the forecasted 1978 return per spawner for the Kodiak-Afognak complex.

DISCUSSION OF THE 1978 FORECAST

Pre-emergent fry sampling indicated generally good to excellent winter survival from a well distributed brood year escapement 14% above the even-year average. Sampling yielded an unweighted index of 245 fry per square meter, a 30% increase above the average even-year index of 171 and one which is second in magnitude only to the fry index of 292 which provided the excellent 1970 return of 15.1 million pinks.

Brood year escapement to the index streams was 85% of the total as compared to the even-year average of 71%.

For 1978, 11.8 to 16.4 million pink salmon are expected to return to the Kodiak management area. With a minimum escapement of 2.7 million desired, a harvest of 9.1 to 13.7 million is expected.

A breakdown of the expected return by major geographical districts is outlined below; all district catch projections assume minimum escapement goals are met:

Afognak District: Pre-emergent fry survival was fairly good from a very good brood year escapement, however, the district fry density was 19% below the even-year average. Index streams received 78% of the district escapement; major production systems will be Portage, Malina, and Afognak Rivers. Some supplemental production is expected from Kitoi Bay hatchery. Approximately 4% of the area return will occur in this district; with minimum escapement requirements of 200,000, a harvest of from 270,000 to 480,000 is expected.

Westside District: Overall pre-emergent fry survival was fairly good from a good brood year escapement. District fry density was 2% below the even-year average due to below average fry production in the northern portion from Zachar Bay to Terror Bay. Index streams received 97% of the district escapement, thus major production systems should be Red River, Karluk, and some Uyak Bay systems. District production should be approximately 35% of the total area return. With minimum escapement requirements of 1.3 million, a harvest of 2.8 to 4.5 million is expected.

Alitak District: Pre-emergent fry survival was excellent from an excellent brood year escapement. District fry density was 67% above the even-year average with record densities occurring in Dog Salmon and Humpy Rivers. Index streams received 81% of the district escapement. District production should be approximately 28% of the total area return and the best district return since 1969. Considering minimum escapement requirements of 500,000, a harvest of 2.8 to 4.1 million is expected.

General District: Overall pre-emergent fry survival was good from a good brood year escapement where the index streams received 69% of the district escapement. District fry density was 16% above the even-year average, however, fry production was spotty, mostly poor to fair in the northern portion from Kizhuyak Bay to Ugak Bay and good to excellent from Kiliuda Bay to Seven River Peninsula. This district should receive approximately 29% of the total area return. With minimum escapement requirements of 450,000, a harvest of 3.0 to 4.2 million is expected.

Mainland District: Pre-emergent fry densities were very good in the Dakavak and Alinchak sections and poor in the Kukak section. Wide Bay and Cape Igvak sections experienced a fairly mild winter and production should be favorable; no pre-emergent work was done in these sections. Index streams received 58% of the district escapement; most production should come from Big Creek, Kashvik River and Dakavak section streams. Approximately 4% of the area return should occur in this district. With minimum escapement requirements of 250,000, a harvest of 230,000 to 420,000 is expected.

Prepared by: Larry Malloy
Assistant Area Finfish Biologist
Kodiak

FORECAST AREA: Chignik

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 2.7 million

Range Estimate: 1.8 million - 3.7 million

FORECAST METHODS

The 1978 pink salmon forecast for the Chignik area is based on the relationship between pre-emergent fry densities and adult returns. Comparative air and water temperatures were also incorporated into this forecast. High and low points for the forecast range are extremes in return-per-spawner data which contained similar climatic conditions.

DISCUSSION OF THE 1978 FORECAST

Eastern District: District pre-emergent fry densities were 66% above average. Poor weather limited the sampling to Main Creek (Amber Bay). Major escapement contributors were Aniakchak River, Chiginagak, North Fork and Hook Bay. Survival appeared fair; some flooding and scouring was observed in Main Creek. Parent year escapement was 294,000 pinks. The anticipated district harvest is 700,000 to 1.7 million pinks, with a 300,000 to 400,000 escapement.

Western District: District pre-emergent fry densities were 15% above average. Survival appeared good; minimal scouring and flooding was observed. The total district escapement was 114,000 pinks. A district harvest range of 200,000 to 600,000 pinks is expected with a 100,000 to 200,000 escapement.

Perryville District: District pre-emergent densities were slightly above the past four year average, but 90% below the highest year (1970). Some scouring and flooding was observed in Ivanof and Humpback Rivers. Parent year escapement to this district was 89,000 pinks. The anticipated district harvest is 200,000 to 550,000 pinks, with a 100,000 to 200,000 escapement.

Prepared by: Larry Nicholson
Assistant Area Management
Biologist
Chignik Area

FORECAST AREA: Chignik

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 1.7 million

Range Estimate: 1.3 million - 2.2 million

FORECAST METHODS

The following methods were used:

1. The relationship between the number of Chignik sockeye returning after two winters in the ocean and the number of three-ocean-aged fish returning the following year is used to forecast the number of returning three-ocean-aged fish. The average number of two-ocean-aged fish is then added to form the lower forecast limit.
2. The average return per spawner times the parent escapements for both the early and late runs is used for the higher forecast limit.
3. The point estimate is the average of the two limits.

DISCUSSION OF THE 1978 FORECAST

The early (June) run to Black Lake is expected to be nearly twice the size of the later run to Chignik Lake, primarily because of the much larger parent escapement to Black Lake. Based on escapement requirements of 650,000, the Chignik sockeye harvest is projected at a little less than 1.1 million, with a range of from 650,000 to 1.5 million.

Prepared by: Arnold Shaul
Chignik Area Biologist
Kodiak

FORECAST AREA: South Peninsula

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 4.3 million

Range Estimate: 3.3 million - 5.5 million

FORECAST METHODS

Application of standard linear regression analysis is inappropriate because of the small sample size and incomplete data set. This forecast incorporates historic return per spawner data, pre-emergent fry densities, mean air temperatures and estuarine temperatures. High and low points for the forecast range are extremes in even-year return per spawner data for years with similar climatic conditions.

DISCUSSION OF THE 1978 FORECAST

Pre-emergent fry indices were the highest observed since this project's inception. Utilizing return per spawner data with similar climatic conditions and escapements indicates a probable return per spawner ratio range of 2.6 to 4.3. Estuarine temperatures were above average, suggesting good fry to smolt survival. Mean ambient air temperatures are highly correlated with return per spawner data, and applying the above return per spawner range to the 1976 escapement of 1.3 million gives an expected return of 3.3 to 5.5 million pink salmon to the South Peninsula.

Southwestern District: District pre-emergent fry densities were above average for even-year index streams. Survival appeared excellent probably because of the mild winter and minimal flooding conditions. Major natural contributors to this district's return will be Volcano Bay, Belkofski Bay, Southern Creek, Russel Creek and Dolgoi Harbor. With minimum escapement requirements of 400,000, a harvest of from 450,000 to 1.0 million pinks is expected.

Southcentral District: The mean fry densities for this district were the highest ever recorded. Survival was good; minimal scouring and warm water temperatures prevailed. The index streams received 85% of the district's escapement; major even-year production systems were Settlement Point, Middle Creek, Canoe Bay River and Mino Creek in that order. With minimal escapement requirements of 400,000, a harvest of 600,000 to 1.2 million pinks is expected.

Southeastern District: District pre-emergent fry density was 30% above the previous record year (1976) . Survival was good from an excellent total escapement of 580,000 pinks. Index streams received 47% of the district's escapement. Major production systems--Dry Lagoon, Squaw Harbor, Orzinski, Lumber Bay and Chichagof Bay--received 40% of the district's escapement. This district should receive 45% of the total South Peninsula pink salmon return. With escapement requirements of 500,000, a harvest of 1.0 to 2.0 million is expected.

Prepared by: Larry Nicholson
Assistant Area Management
Biologist
Chignik Area

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 11.5 million

Range Estimate: 7.0 million - 16.0 million

FORECAST METHODS

Most Bristol Bay sockeye salmon mature 4 to 6 years from the time of spawning. The run in 1978 will, therefore, be the progeny of the escapements of 1972, 1973, and 1974. The total Bristol Bay forecast is the sum of the forecasts of individual river systems, each based on one or more of the following methods:

- (1) Escapement-return relationships, based on historical data, provide estimates of total production from each brood year escapement. Average marine maturity schedules are then applied to estimate the numbers of adult salmon returning each year.
- (2) On the Kvichak, Naknek, and Wood Rivers, numbers of smolt migrating to the ocean are enumerated annually. The return of adult salmon each year is estimated using these smolt counts, past survival data and average maturity schedules.
- (3) For each river system, relationships between the number of adult fish returning in a particular year and the number of adult fish from the same parent escapement and freshwater age group that will return the following year have been derived.

To aid in the selection of forecast techniques a measure of residual variance, the standard error of forecast, is calculated for each method, age class and system.

DISCUSSION OF THE 1978 FORECAST

The pre-season forecast of the 1978 Bristol Bay sockeye salmon return is 11.5 million. For the first year since 1971 the run is expected to exceed the average total return for similar mid-cycle years (1958, 1963, and 1968, for which the average return was 7.6 million).

No projection of the 1978 Japanese high seas mothership catch of Bristol Bay sockeye salmon will be made as negotiations are currently under way to bring the fishery in line with the U.S. Fishery Conservation and Management Act of 1976. The 1977 Japanese high seas catch of 165,000 immature Bristol Bay sockeye salmon has been deducted from the 1978 forecast return.

Escapement requirements for Bristol Bay in 1978 total 5.5 million sockeye salmon. Analysis of the projected inshore run by system indicates a harvestable surplus of 6.3 million which is 3.4 million above the past average harvest for similar mid-cycle years. Significant harvests are expected in all of the Bay's commercial fishing districts with one exception. For the second consecutive year, the Ugashik District sockeye return is expected to be below escapement requirements. The point estimates of allowable harvest by district in descending order of magnitude are: Naknek-Kvichak with a harvest of 4.1 million, Nushagak with 1.2 million, Egegik with 900,000, and Togiak with 200,000.

The above-average Kvichak River run forecast for 1978 was anticipated in the Kvichak River escapement management plan adopted by the Department in 1969. The plan calls for increased escapements in pre-peak as well as peak years with the objective of spreading peak year sockeye salmon production over several years in the system's 5 year cycle. The anticipated strong return to the Kvichak River system (5.1 million) is primarily the result of the 4.4 million escapement obtained in 1974 (a pre-peak year) which produced an estimated 100 million Age I smolts. Based on past Kvichak system data, the majority of these smolts will return as 4 year old adults. Similarly, the Wood River system return will also be dominated by 4 year old adults from the 1974 escapement of 1.7 million. Due to the extremely poor escapements obtained in 1973, the 1978 Bristol Bay run is not expected to have many 5 year old adults.

Prepared by: Kenneth Parker
Bristol Bay Research
Anchorage

FORECAST AREA: Nushagak District, Bristol Bay

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1978 RETURN:

Point Estimate: 3.2 million

Range Estimate: 2.0 million - 4.0 million

FORECAST METHODS

The 1978 forecast is based on the ratio of the number of returning fish to the number of spawners in the parent year (1976). A return per spawner ratio of 3.7 was used to calculate a 1978 forecast of 3.2 million pinks. This ratio is an average for even-year runs in 1962, 1964 and 1974. Entire district-wide escapement estimates were obtained only in 1962, 1964, 1974 and 1976. For all years available (1958-1974) the average was 4.6 which gives a 1978 forecast of 4.0 million pinks. Since a significant number of fish spawn in areas not enumerated in most seasons, the 1978 forecast was based on return per spawner data from years with complete escapement estimate coverage. Beginning in 1974 the pink escapement assessment program was expanded to cover the entire Nushagak drainage. Once an adequate data base is established, improved forecast accuracy will hopefully result.

DISCUSSION OF THE 1978 FORECAST

The 1976 escapement of 863,000 pinks to the Nushagak District was well distributed and optimum numbers were recorded in most spawning systems. Water levels and spawning conditions were excellent for good initial survival of eggs. Temperatures in the winter of 1976-1977 were extremely mild, and water levels were sufficient throughout the winter. A heavy snow cover provided excellent insulation in late winter.

Escapement requirements will range from 600,000 to 1 million fish, with a point optimum escapement of 800,000 for the entire district. The harvest is estimated at 2.4 million fish, after escapement requirements are obtained.

Prepared by: Michael L. Nelson
Area Management Biologist
Bristol Bay
Dillingham

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